



# Fundamental Physics I

PHYS105

## Instructor Info



Prof. Karen Masters



Student Hrs: Wed 12.30-1.30pm (Coop); Thur 11.30am-12.30pm (ASTR204 priority) and 3-4pm (PHYS105 priority). Or by appointment.



Observatory A



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## Course Info



Prereq: Phys Placement. MATH118 (Calculus; co-req)



Class: Mon, Wed, Fri. Problem Solving Workshop Thur 2-3pm (TBC).



11.30am-12.30pm



KINSC H108

## Lab Info



Alternate weeks on Tue, Wed or Fri



1.30-4pm



Intro Physics Lab

## TA Info



TBA



Clinic: Thursday Night



Physics Lounge

## Overview

PHYS105 is the first in the two semester introductory Physics series aimed at students interested in physical sciences.

Topics will cover (Newtonian) mechanics (including equations of motion, in one, two and three dimensions using vector algebra; work-energy, energy conservation, rotation and angular momentum, gravity and orbits and static equilibrium); an introduction to oscillations; and waves and thermodynamics. Examples will primarily be from physical sciences. Knowledge of calculus is assumed.

These topics (along with those in PHYS106) are the foundations of the physics which is used to explore the Universe from the smallest subatomic particles, to the largest known structures, as well as the physics which helps build our modern world.

## Material

We will use the Open Stax "*University Physics*" textbooks (Volumes I and the first half of Volume II), which are available (free) online at <https://openstax.org/>.

It is not necessary to purchase a hard copy (although they are available). Unless noted reading assignments are from Volume I.

If any student finds a significant error (not a simple typo, but something which impacts understanding – as verified by the Professor) in either of these open source books they will be rewarded with the option to drop their worst HW grade at the end of the semester.

## Diversity and Inclusivity Statement

Our classroom should be a place where all members will be treated with respect. I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability - and other visible and non-visible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class. If something was said in class (by anyone including myself) that made you feel uncomfortable, please talk to me about it (anonymous feedback is always an option). I appreciate any opportunity to continue my learning about diverse perspectives.

In an ideal world, science would be objective. However, science is done by people, and is historically built on a small subset of privileged voices. In this class, we will make an effort to notice the contributions of diverse group of scientists, but limits still exist on this diversity. I believe that integrating a diverse set of experiences is important for a more comprehensive understanding of science.

## Honour Code

Collaboration is an important part of science. You are strongly encouraged to work together and/or consult one another for work in this class. You are encouraged to consult any books necessary as well as resources on the internet. You must, however, turn in your own individual homework, and this must be written on your own. Copying and pasting (even parts of sentences) is not permitted and is a violation of the Honour Code. Good collaboration involves everyone understanding what is going on in the assignments. Therefore even if the basic solution is shared you must explain it in your own words (including mathematical words). Please list any students that you collaborated with. Please pay attention to your classmates to make sure no one is being left out of collaborative work.

You may not obtain materials from students who have taken this course in previous years, nor may you distribute your current materials to students not currently enrolled in this class. Please consult me if you have any questions.

# FAQs

## ? How Should I Work on Physics Problems?

! Try them first alone, but then (as long as the HW doesn't ask you to work on a problem individually) it's best to work with others. You will learn much more by talking through problems together. Find a study group.

## ? How Can I Best Support My Learning in this Class

! Make sure to attend all classes, and keep up with the schedule. Talk to the Professor as soon as you feel like you are falling behind (don't leave it too late). Attend the weekly Problem Workshop session, Physics Clinic, and student office hours. My goal is to support you to succeed in this class, so help me to help you.

## ? What Physics is Covered in this Class?

! Newtonian) mechanics (including equations of motion, in 1-3D with vectors, work-energy, energy conservation, rotation and angular momentum, gravity and orbits, static equilibrium), an introduction to oscillations and waves and thermodynamics.

## ? What's the Best Kind of Physics?

! I'm obviously going to say astrophysics since this is my research area. One of the reasons I love astrophysics though, is that it uses material from all areas of physics to study the most fascinating and extreme objects in the Universe. All topics covered in this class are important in some way to the study of astrophysical objects, as well as many other areas of Physics.

## Grading Scheme

30%	Homeworks
25%	Labs
10%	Participation and Contributions
20%	Two midterms (10% each)
15%	Final Exam

## Homework Assignments

Homework will be due almost every week on Friday before class. You will submit electronically via Moodle and/or WebAssign (and sometimes OpenMath). Please use a Scanner (or Free Scanning Ap on your phone) to create a single PDF of your handwritten work to upload to Moodle. Do not write your name on the scanned document (to enable blind grading).

The expectation for homework, lab reports and other written work, is that a physicist will be able to understand exactly what you're calculating and why without looking at the question you were asked. A lot of learning takes place in the process of doing science, not in simply getting a numerical answer as quickly as possible, and written work will be evaluated as such. Please show your work cleanly and neatly, and help us to give you partial or full credit! It will help your grade if you are neat and organized – we can't grade what we can't read.

You will have the opportunity to resubmit your Homework to recover 50% of lost points by explaining what you did wrong. This resubmission will be due a week after the first submission. No extensions are possible on resubmissions.

## Intro Lab

You will be assigned to a Lab Section to support this course. Labs will happen every other week, and Lab Reports are due (to Paul Thorman) the following Friday. You must attend all labs. Contact Paul if you are not able to make your assigned lab.

## Participation

Participation is more than just attending lectures (although not attending will hurt your participation grade). My assessment of your participation and contributions will factor in your positive efforts to engage with the material, your coming to class prepared (having read the material, and done any pre-class e-assignments), your professional and respectful interactions with other members of the class, and your willingness to share your knowledge and understanding with others.

There will be pre-class material posted to turn in online. While this will not be formally graded, missing significant amounts of this will count against your participation grade.

Attendance at Problem Solving Workshop and Student (office) Hours will be noted and count as a positive sign of participation.

## Midterms and Final

There will be two midterms and a final. These will all be closed book take-home exams. You should not consult any materials except a 1 page (2 for the final) "cheat sheet" you will turn in with the exam. You will hand exams in on paper in the Dropbox outside my office (in the Observatory). Write only your assigned ID on the main paper (to enable blind grading).

**Midterms** - These will be posted on Wed 2nd Oct, and Mon 4th Nov. You may take these in any continuous 2 hour period before the turn-in deadline on Fri 4th Oct (note that class is cancelled this day to give you extra time) and Fri 8th Nov respectively. There will be no HW the week of the midterms, and the Thur Problem Workshop will be used to review practice exam questions.

**Final** - This will be similar to the Midterms, except you will be allowed to take 3 hours. There will be an exam review session on the Monday of exam week.

## Blind Grading

Blind grading has been demonstrated to reduce unconscious bias (both positive and negative) in grading.

For this reason, while I will review your HW and midterms after they are graded to check on your progress in the course, the graders will not know whose assignment they are grading.

Please do not write your name on your HW or exams before you scan it/turn it in. Scanned HW will be turned in via Moodle which manages blind grading. For the exams please identify yourself using only a 5 digit random number I will assign you before each exam.

## How to Succeed

My goal is to help everyone to succeed in this class. It will be hard work (learning always is), but I am confident you can do it.

Including lab, lecture, and recitation, this class will have 6.5 "contact hours" between instructors and students. The problem sets & reading assignments for this course should take between 7 and 8 hours. If they take significantly more or less time, please let me know. I value student feedback, and will try to adjust the schedule accordingly, within the constraints of the essential material.

Lectures will be (technology willing) recorded on Panopto and made available for review on the Moodle site. A selection of example problem solutions, or explanations of selected topics will be posted as short "Explain Everything Videos" (on Moodle).

There will be a Problem Solving Workshop every Thursday afternoon 2-3pm, which is a space for you to collaboratively work on HW or discuss class material in small groups. I may also use some of the time to work through example problems.

The Physics clinic (staffed by upper level Physics students) will be on Thursday nights to support your work on the HW.

The Maths clinic is also available for support in Math. I will also provide suggested material in MyOpenMath.com for extra review of Math topics.

If you cannot make my posted Student hours, you can see when my calendar thinks I'm free (and likely working in my office in the Observatory) here: <https://calbird.com/karen/1136>.

The best way to contact me is by email, and I'm very happy to help with short questions via email.

## Extensions and Absences

You are expected to attend all lectures, having done the required reading. Unexplained absences (i.e. not caused by illness, emergency or religious observance) numbering more than two will count against your participation grade. Please email me (in advance if possible) if you know you need to miss class.

You will not be able to participate fully in class if you do not keep up with the HW schedule. However, if requested in advance, a 48 hour extension will be granted no questions asked. If you do not ask in advance, or need to go beyond that (without a formal accommodation), 10% credit will be lost each day that any assignment is late, up to 50% off. After ten days late, an assignment will earn no credit.

There will be no extensions on the midterms except with the approval of your Dean.

## Accommodation Statement

Haverford College is committed to providing equal access to students with a disability. If you have (or think you have) a learning difference or disability – including mental health, medical, or physical impairment, please contact the Office of Access and Disability Services (ADS) at [hc-ads@haverford.edu](mailto:hc-ads@haverford.edu). The Coordinator will confidentially discuss the process to establish reasonable accommodations.

Students who have already been approved to receive academic accommodations and want to use their accommodations in this course should share their verification letter with me and also make arrangements to meet with me as soon as possible to discuss their the specific accommodations. Please note that accommodations are not retroactive and require advance notice to implement.

It is a state law in Pennsylvania that individuals must be given advance notice if they are to be recorded. Therefore, any student who has a disability-related need to audio record this class must first be approved for this accommodation from the Coordinator of Access and Disability Services and then must speak with me. Other class members will need to be aware that this class may be recorded. It is my intention to record all classes in Panopto to make them available.

## Class Schedule (Subject to Change)

Week	Topic	Reading	Lab/HW/Exam
<b>Mechanics</b>			
Week 1: 4-6th Sept	What is University Physics. How to read a physics book. Ch 1,3 Units and Measurement. Motion Along a Straight Line		
Week 2: 9-13th Sept	Vectors, Motion in Two and Three Dimensions	Ch2, 4	HW1 (Units and Estimation, Vectors, Calculus Review).  Pendulum Lab.
Week 3: 16-20th Sept	Newton's Laws of Motion (1-2)	Ch 5,6	HW2 (Vectors, Motion in 2-3D, Newton 1)
Week 4: 23-27th Sept	Work, Energy and Power (in Physics)	Ch 7	HW3 (Applications of Newton's Laws).  Tonka Lab.
Week 5: 30th Sept - 4th Oct	Potential energy, conservative and non-conservative forces	Ch 8	Midterm 1 (Topics on HW 1-3)
Fri 4th Oct	KLM out of town. No class (use the time for extra study for the midterm)		
Week 6: 7-11th Oct	Linear Momentum and Collisions	Ch 9	HW4 (Work-Energy, Conservation of Energy).  Energy Lab.
<b>Fall Break Oct 11-21st</b>			
Week 7: 21st-25th Oct	Rotation and Angular Momentum	Ch 10,11	HW5 (Linear Momentum)

Week	Topic	Reading	Lab/HW/Exam
Week 8: 28th Oct - 1st Nov	More Rotation. Static Equilibrium	Ch12	HW6 (Rotation and angular momentum). Collisions Lab.
28th, 30th	KLM out of town. Prof. Amador-Kane will take class.		
Week 9: 4-8th Nov	Gravity and Orbits	Ch13	Midterm 2 (topics on HW4-6)
<b>Waves and Optics</b>			
Week 10: 11-15th Nov	Oscillations	Ch15	HW7 (Gravity and Static Equilibrium). Rotation Lab.
Week 11: 18-22nd Nov	Waves	Ch16	HW8 (Oscillations)
Week 12: 25-27th Nov	Sound and Acoustics	Ch17	No HW due.
<b>Thanksgiving Nov 28-29th</b>			
<b>Thermodynamics</b>			
Week 13: 2-6th Dec	Thermodynamics	Vol II Ch1,2	HW9 due Mon (Waves, Sound). Sound Lab.
Week 14: 9-13th Dec	More Thermodynamics	Vol II Ch3,4	HW10 due Mon (Thermodynamics)
<b>Exam Week</b>	<b>Final Exam</b>		